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(54) **PULSED LASER CLEANING OF DEBRIS ACCUMULATED ON GLASS ARTICLES IN VEHICLES AND PHOTOVOLTAIC ASSEMBLIES**

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(57) **ABSTRACT**

A cleaning system for a vehicle includes a beam optics assembly that emits a laser beam to irradiate a region on a glass article of the vehicle, debris detection circuitry that detects debris accumulated over the region, and control circuitry. The control circuitry calibrates a set of parameters associated with the laser beam emitted from the beam optics assembly based on detection of the debris accumulated over the region on the glass article, controls an exposure level of the laser beam on the debris accumulated based on calibration of the set of parameters associated with the laser beam, wherein the exposure level is controlled based on pulsing the laser beam at a calibrated rate that limits penetration of the laser beam to a depth that is less than a thickness of the glass article, and removes the debris accumulated over the region on the glass article using the laser beam.